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ABSTRACT

The knowledge distributed Web-based learning community (KnowDisLC) based on knowledge sharing for college students has been constructed, implemented and evaluated. The system helps students form a virtual learning community through Web-based learning, which they can use to facilitate learning and growth. Ultimately they would like to accomplish the goals of knowledge sharing, resource sharing, information exchange, experience interchange, and emotion communication. Both a point accumulation mechanism and a Web-based learning record have been the features of the KnowDisLC system, which prove to stimulate student involvement by allowing them to know about the performance and involvement of themselves and their peers. Most students agree that the community could help them learn more and faster, and most students also confirm that the overall operation and implementation of the system is generally good. (Author)

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A Case and Implications of Implementing and Evaluating an Online Virtual Learning Community Environment

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ABSTRACT

The knowledge distributed web-based learning community (KnowDisLC) based on knowledge sharing for college students has been constructed, implemented and evaluated. The system helps students form a virtual learning community through web-based learning, which they can use to facilitate learning and growth. Ultimately they would like to accomplish the goals of knowledge sharing, resource sharing, information exchange, experience interchange, and emotion communication. Both a point accumulation mechanism and a web-based learning record have been the features of the KnowDisLC system, which prove to stimulate student involvement by allowing them to know about the performance and involvement of themselves and their peers. Most students agree that the community could help them learn more and faster, and most students also confirm that the overall operation and implementation of the system is generally good.

LEARNING COMMUNITY ON THE WEB

Although some research in Taiwan on web-based learning environments and knowledge guidance systems for in-service teachers has noted the concepts of a learning community, none of them has developed any system based on the complete idea of a learning community. However, there are many related systems, documents and research all over the world. Founded on the concept of community of practice, CoVis (Learning through Collaborative Visualization) aims at research related to science learning (climatology and geology) (Pea, 1993). It provides online discussion, e-mail, teleconferencing and other WWW tools to link experts, teachers, students and field workers to form a collaborative learning community. Students may actively learn through participating in knowledge building, knowledge sharing and collaborative-based activities as a member of an online group (Brandon & Hollingshead, 1999).

CSILE (Computer-Supported Intentional Learning Environment) is a kind of collaborative database style of learning community which aims at providing students with strategic tools that can stimulate thinking. In CSILE's collaborative database, students can share knowledge asynchronously. A student can access the thoughts of the present or former students and can leave his own thought for other students. CSILE was used in the context of a community with emphasis on "knowledge building and sharing" instead of "knowledge inoculating." An evaluation by Scardamalia & Bereiter (1994) of the CSILE project clamed that the collaborative learning community formed by students facilitated knowledge building and generated positive learning outcomes with the use of telecommunication technologies. Whereas use of technology does not absolutely make a community occur, a learning community needs to be planned and created.

SYSTEM ENVIRONMENT

The KnowDisLC provides access to utilities that include an ID verification center, news bulletin board, counter of online user number, discussion board, curriculum center, learning activity bulletin, learning resources browsing and sharing, user profile center, expert consultation, website resource searching, opinion bulletin board, point accumulation system, web-based learning record, and system management. Dynamic HTML flexible menu has been adopted in the system to avoid a problem of long screen resulting from too many sub-menus of functional buttons.

The construction of a point accumulation system for learning activity is one of the features of the KnowDisLC system. It displays both the learning score and frequency of visits of each user. It is a reference for performance evaluation of students. To increase student motivation, the system gives users different scores according to their involvement in the web-based learning, e.g. logging on to the system (1 point a day), sharing and provision of file resources, sharing and provision of related websites, participation in discussion (raising questions and making replies), moderating a discussion or conference. The second feature of the KnowDisLC system is its web learning

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status log, including learning log statistics, conference records, assignment upload statistics, performance statistics for discussion or conference moderators, etc. This facility can be used by students in order to find their learning status at anytime and use it as a reference for correction. The website and file resource browsing and sharing functions are based on the concepts of sharing and provision of knowledge, distributed knowledge, knowledge building, and information exchanging. This is the third feature of the KnowDisLC system. Community members can enter or link to the URL address of a related learning resource site and upload/share or download/browse files of materials related to course subject for the goals of collaborative academic growth.

IMPLEMENTATION AND ISSUES

The aim of the implementation of the KnowDisLC was to observe the collaborative learning that was taking place in the system. Since the development of the KnowDisLC, we have been using it as part of teaching materials in the class and self-oriented learning materials after the class of "Distance Education" in my Department. Students study the "Distance Education" course through learner-centered, inquiry-based, discussion-oriented, and project-based learning activities in the virtual social community on the Web environments.

It began in 2001 Spring Semester with 67 college students in our department as well as 1 teacher, 1 online assistant and 1 field expert. It has now expanded to include around 103 college students as well as 2 teachers, 2 online assistants and 2 field experts in "Distance Education" course. The KnowDisLC is committed to supporting the spread of project-based learning in which students formulate their own questions, exchange their information, provide distributed knowledge, share learning resources, collaboratively work on their project and homework, build their own knowledge, while being guided and facilitated by their teachers, field experts, and experienced students (Cang, 2000).

The course required students to evaluate other students' posts and replies in discussion, information sharing and resource provision. The teacher required students to collaboratively find a case study using real-world problems or cases and to collaboratively analyze information and propose a resolving method as part of their response.

We used project-based collaborative learning to develop transferable skills, enhance knowledge-building, facilitate teamwork and mentor skills of the students. Students were encouraged to do collaborative exercises by sharing ideas, exchanging information, providing resources, and constructing knowledge toward finding a solution to their common learning objectives. Students shared the idea and knowledge by uploading learning materials, providing the addresses of web sites, and posting the idea in the discussion board. During group collaborative learning and doing project, groups of 3-4 students solve a problem or create a teamwork product collaboratively through the use of a conference room, discussion board, e-mail, and mailing listserv. Groups of 3-4 students were assigned problem-based learning exercises in the courses to solve collaboratively.

Implementation results of the KnowDisLC showed that using the telecommunication technologies took more time than learning the on-line course materials and participating in the learning activities on the web. Based on a review of the records of web activities, the more actively the students participated in the web-based activities the better performance students had in classroom instruction. In other words, highly motivated students generally participated much more than poorly motivated students. It reveals that there is a positive correlation between the participation in web-based learning activities and the participation in classroom instructional activities.

This results are quite consistent with a study of the Virtual Classroom by Hiltz' (1993) concluding that students with a high level of academic performance and self-motivation in classroom setting would have more positive outcomes on online activities. Using the telecommunication tools on the virtual learning environment, college students have access to large amount of information and knowledge provided by their peers in the class and experts in the field.

SYSTEM EVALUATION

An evaluation of the system was conducted right after the 3-month implementation of the KnowDisLC. Its purpose was to understand the effects and pertinence of the implementation of the KnowDisLC in university education. A target group of the evaluation consisted of 67 students who took the courses. They were all required to use KnowDisLC and gave comments related the system. The evaluation was conducted through a questionnaire survey; a self-developed 5-point Likert rating scale evaluation form was distributed to the students. After the evaluation,

students completed the questionnaire. The questionnaire included six main evaluation items : system contents, screen design, user interface, system functions, use frequency, and learning effects. Resulting from the survey of students' satisfaction showed that in general, they rated their learning experiences in the web-based learning environment consistently higher than those in the instruction of traditional classrooms. As far as the students' feedback on the satisfactions for the content, interface, and functions of KnowDisLC system reported that the system interface was easily accessible and usable to users.

System Content

In the comparison of the content adequacies of KnowDisLC elements, students perceive that *linked website* is the most adequate element for content (mean = 4.5). As high as 92.3% of the students regard *linked website* adequate to support their learning. Only 7.7% of the students think otherwise. The subsequent elements are *bulletin board posting* (mean = 4.31), *website searching* (mean = 4.08) respectively. Adversely, students perceive that the *discussion posting and replying* (mean = 3.15) is the least adequate elements for content. 34.6% of the students regard that quality and quantity of the *discussion posting and replying* are adequate to support their learning. 23% of the students think otherwise. These results reveal that students' posting and replying in discussion board need to be improved. As a matter of fact, we also regard that there are actually much room for improvements such as course materials, and file/work. Figure 1 shows the distribution of the means for student comments on the content adequacies of KnowDisLC elements.

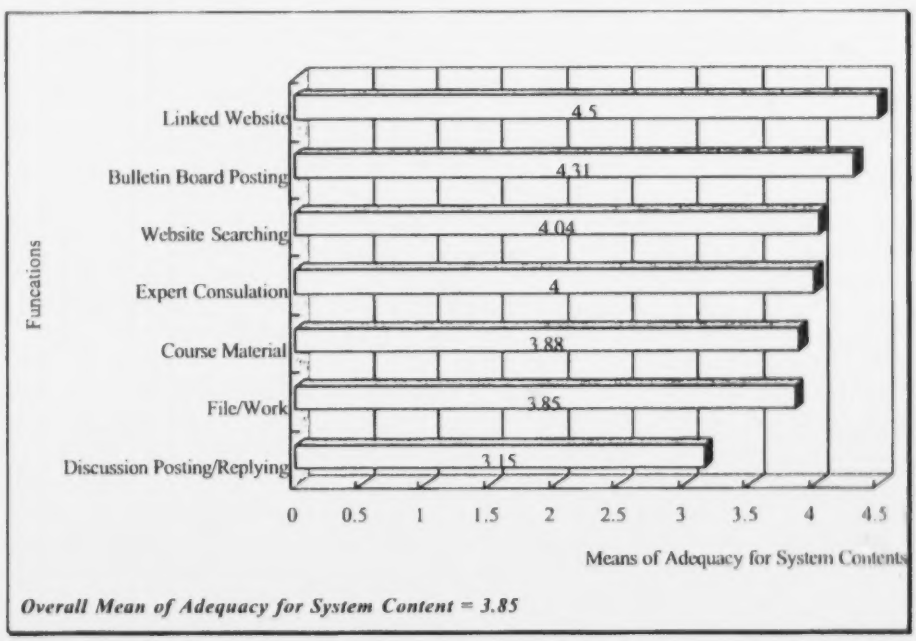

Figure 1. *The distribution of the means for student comments on the content adequacies of KnowDisLC elements*

User Interface

In the comparison of the interface applicability of KnowDisLC elements, students perceive that the interface of *opinion bulletin board* is the most used-friendly (mean = 4.46). As high as 92.3% of the students regard the interface of *opinion bulletin board* easy and convenient to operate. No one (0%) thinks otherwise. The subsequent elements are *online registration* (mean = 4.38), *ID verification center* (mean = 4.35), and *website sharing* (mean = 4.27) respectively. Adversely, students perceive that the interfaces of *synchronous conference room* (mean = 3.58), *online calling* (mean = 3.69), and *course material* (mean = 3.81) are the less used-friendly. As high as 61.7% of the students regard that the interface of *synchronous conference room* easy and convenient to operate, however, 26.9% of the students think otherwise. Figure 2 shows the distribution of the means for student comments on the interface applicability of KnowDisLC elements.

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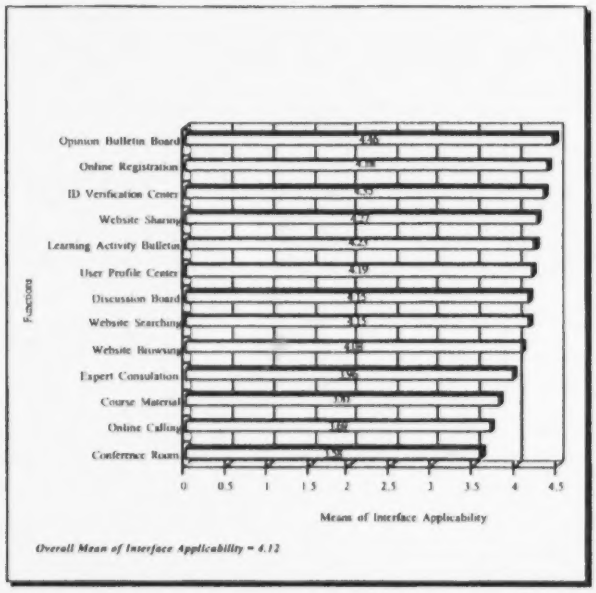

Figure 2. *The distribution of the means for student comments on the interface applicability of KnowDisLC elements*

System Functions

In the comparison of the functional applicability of KnowDisLC elements, students perceive that *ID verification center* is the most applicable-functionally element (mean = 4.31). As high as 80.8% of the students regard function of *ID verification center* applicable to use. No one (0%) thinks otherwise. The subsequent elements are *activity bulletin board* (mean = 4.19), *news bulletin board* and *asynchronous discussion board* (mean = 4.15) respectively. Adversely, students perceive that the *website index* (mean = 3.5), *file/work resource index* (mean = 3.54), and *synchronous conference room* (mean = 3.54) are the less applicable-functionally elements of the system. 53.8% of the students regard that the *website index* is applicable to use, however, as high as 26.9% of the students think otherwise. Figure 3 shows the distribution of the means for student comments on the functional applicability of KnowDisLC elements.

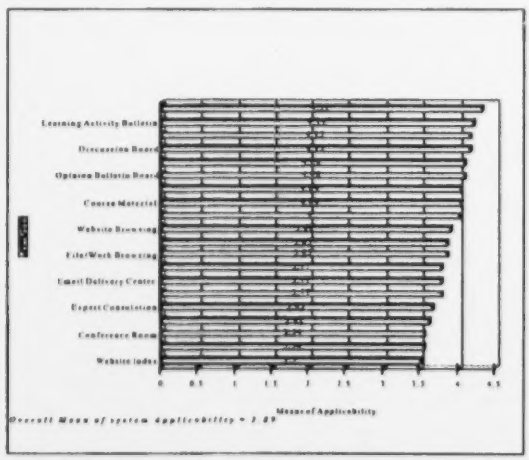

Figure 3. *The distribution of the means for student comments on the functional applicability of KnowDisLC element*

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Use Frequency

Most students approve of the overall operation and instructional application of the KnowDisLC system, whereas, there are still some functional elements that are rarely used by students. The less-frequently used functions include *expert consultation, website sharing, online calling, ……, synchronous conference room* and so forth. The results show that although the system functions and learning effect are generally both good, there is still wide room for improvement with uses, operation, implementation and management of the system.

This low use of the system in comparing with the system contents, screen design, user interface, system functions, and learning effects, the performance of the users in terms of system use seems to be far behind. This phenomenon shows that even if the system is a rather good one, the users may still encounter other practical difficulties in using it. These difficulties might be the key factors that decrease the successful possibility of online learning community. Therefore, it has turned out to become an issue worthy of further research and investigation.

In the comparison of the use frequencies of KnowDisLC elements, students perceive that *news bulletin board* is the most frequently used element (mean = 4.19). As high as 76.9% of the students frequently visit *news bulletin board* to see news announced by the teacher or system manager. No one (0%) rarely visit *news bulletin board*. The subsequent elements are *asynchronous discussion board* (mean = 3.42), and *website searching* (mean = 3.42) respectively. Adversely, students perceive that the *expert consultation* (mean = 2.0), *website sharing* (mean = 2.58), *and online calling* (mean = 2.77) are the most rarely used elements of the system. No one frequently ask question for the expert (0%). As high as 65.4% of the students rarely ask question for expert. In comparison with overall mean of the system use (overall mean = 3.25), the means of use frequencies for these three least used elements seem to be quite behind. Figure 4 shows the distribution of the means for student comments on the use frequencies of KnowDisLC elements.

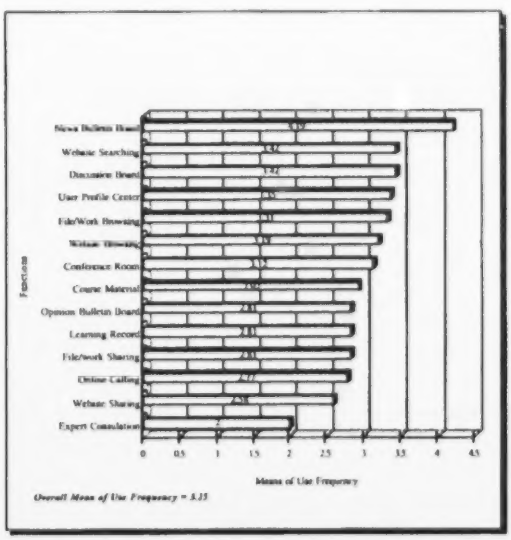

Figure 4. *The distribution of the means for student comments on the use frequencies of KnowDisLC elements*

Impacts on Learning

In terms of negative comments on the effects of KnowDisLC, 11.5% of students regard that the articles in the *asynchronous discussion board* posted are not beneficial to their academic growth (mean = 3.65). As high as 23.1% of the students regard that the communication mode in the *asynchronous discussion board* cannot enhance the interaction between them and other students (mean = 3.46). 15.4% of the students regard that the discussion mode in the *online synchronous conference room* cannot promote their abilities of discussion with people (mean = 3.5). 11.5% of students regard that the *opinion bulletin board* cannot make them know the feelings of other students and cannot achieve the goal of emotion communication (mean = 3.58). However, averaging the above two items (mean = 3.65+3.46 = 3.56), the mean of usefulness for the *asynchronous discussion board* will be 3.56; thus the perceived least beneficial element of the KnowDisLC system will be the *online synchronous conference room* (mean = 3.5).

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In the comparison of the effects of KnowDisLC elements, students perceive that *point accumulation system* is the most beneficial element (mean = 4.23). As high as 80.8% of the students regard *point accumulation system* useful to stimulate learning motivation and make their learning outcomes better (mean = 4.23). Only as low as 3.8% of the students think otherwise. The subsequent elements are *resources browsing* (mean = 4.08), *course material* (mean = 4.08), *file/work* (mean = 4.08), and *linked website* (mean = 4.0) respectively. Adversely, students perceive that the *online synchronous conference room* (mean = 3.5), *asynchronous discussion board* (mean = 3.56), and *opinion bulletin board* (mean = 3.58) are the less beneficial elements of the system. *online synchronous conference room* is the least effective element (mean = 3.5). However, in terms of interactive effect, it is slightly more interactive than *asynchronous discussion board*. As high as 15.4% of the students regard that the discussion mode in the *online synchronous conference room* cannot promote their abilities of discussion with people (mean = 3.5). In comparison with overall mean of the system (overall mean = 3.89), the means of effects for these three least effective elements seem to be quite behind. Figure 5 shows the distribution of the means for student comments on the effects of KnowDisLC elements.

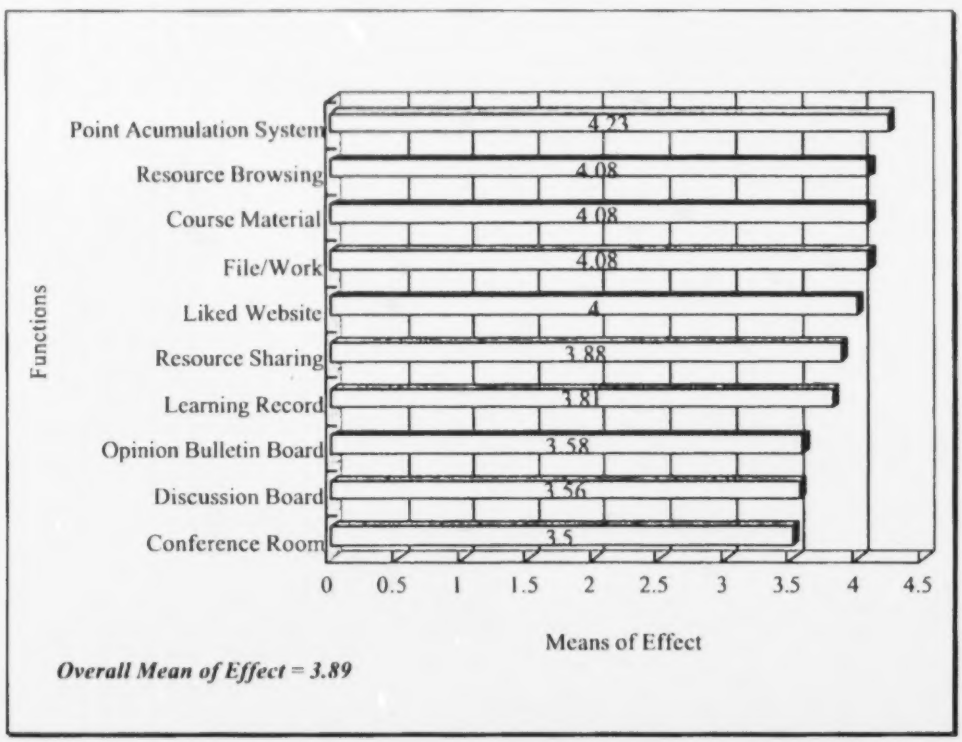

Figure 5. *The distribution of the means for student comments on the effects of KnowDisLC elements*
Note: Resource includes file/work resource and website resource

IMPLICATIONS AND LESSONS LEARNED

There were many lessons learned regarding the KnowDisLC system, from physical setup to technological support, to teachers' teaching preparation, and to students' learning experiences and so forth. Important considerations about technological support were: the reliability of the server and the system software, the technical support available for the users, less waiting time when browsing and navigating system, friendly use of the system interface, and easy access to the system content, and so forth.

Over the past semester, the successes of the KnowDisLC have argued strongly for the value of web-enhanced learning environment for college students. The creation and implementation of the KnowDisLC system has obtained

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high support from students and teachers, therefore additional materials for other courses provided by the Department are being developed. Integrating traditional classroom instruction and web-based learning appears to have become a major departmental focus primarily due to the greatly successful experiences of the creation and use of the KnowDisLC system.

Based upon the observation of the learning behaviors taking place at the KnowDisLC, it is apparent that the facilitators such as teacher, tutor, and online teaching assistant have an important role to strike the desired balance of motivator, mentor and mediator which can affect the success of a learning community. The role of teacher is changed from a knowledge provider to an informational facilitator and a learning mentor. Teacher has become guides and coaches, while students have taken a more active role during the learning process in the KnowDisLC. Students in the learning community gain more attention from instructor and online assistant. Additionally, they may spend more time thinking about, responding to, and exploring, whatever question peers or instructors give.

One interesting observation is that the grade point computing system resulted from the records of web activities such as login frequency, staying time on web, discussing frequency (post and reply), the frequency of learning resources provision etc. may highly stimulate more students to actively participate web-based learning activities. Additional, allowing students to view each other's work and project appeared to result in a better expression of ideas among them.

The web-based learning environment may play a great role of equalizer through providing an alternative for students to participate in the web's interactive activities such as asking questions and discussions, and to actively give feedback to each other and to instructor. Just like Palloff and Pratt (1996) claim, introverted students who may not feel comfortable speaking out or asking for help in a face-to-face classroom may flourish in an online learning community. Moreover, most of students gain the gratification of control over their time during online learning and the opportunity to be more thoughtful about their interactions (Palloff and Pratt, 1996, p.164). This kind of equal opportunity is especially suitable to those who shy away from speaking up when face-to-face in traditional teaching situation but who eagerly share their ideas on the web.

Web-based learning absolutely has the positive effects on student participation and learning outcomes. Moreover, it can encourage peer-to-peer interaction, increase student motivation and engagement in the learning process, and reduce some barriers of participation that are present in face-to-face mode. This study identified that a web-based learning environment appears to promote comprehensive and critical thinking as well as to empower and engage active learning. The KnowDisLC has reshaped individual and active learning experiences for many students at our university. Encouraged by the success of the KnowDisLC, we are intended to engage in developing the other learning subjects.

CONCLUSIONS AND FUTURE WORKS

The research has designed, constructed and evaluated a distributed knowledge learning community as an aide to web-based learning, in hopes that it will help students form a virtual learning community through web-based learning. They can use the system to facilitate learning and academic growth through the curriculum center, discussions, conferencing, learning resources browsing and sharing, expert consultation, web resource searching, and opinion bulletin board. Ultimately they would like to accomplish the goals of knowledge sharing and provision, resource sharing and provision, information exchange, experience interchange, and emotion communication. The KnowDisLC provides college students with effective telecommunication and collaboration tools, and students' responses toward KnowDisLC have been very positive and encouraging. The KnowDisLC thus facilitates academic growth and interpersonal interaction of college students through collaborative learning environments and telecommunication tools in the context of a virtual community.

Both a point accumulation mechanism and a web-based learning record have been the features of the KnowDisLC system, which prove to stimulate student involvement by allowing them to know about the performance and involvement of themselves and their peers. The system has been officially implemented in a university course for 3 months, and both the implementation and operation are running smoothly. The system evaluation shows that most users are satisfied with the system contents, screen design, user interface, and system functions. Most students agree that the community could help them learn more and accelerate their professional growth. In addition, they also confirm that the overall operation and implementation of the system is generally good.

With regards to use frequency of the KnowDisLC system, most students approve of its overall operation and instructional application. However, there are still some functional elements that are rarely used by students. What we have received negative feedback are the less-frequently used functions such as *expert consultation, website sharing,* and *online calling*. The results show that although the system functions and learning effects are generally both good, there is still much room for improvement with using and management of the system functions.

Standard computer-mediated communication technologies of the Internet and the Web are used and benefit has been obtained from the development in the KnowDisLC system. The establishment of a virtual distributed and collaborative learning community will be an important outcome dedicated to college teaching and learning. KnowDisLC certainly has its problems and limitations, but the lesson of its developing and implementing experience in creating a lively social system is that there are knowledge-sharing mechanisms that can have an important effect on encouraging active learning and thus successful online learning communities.

In the future, we will reinforce: expansion and maintenance of system functions; the automatic management, and learning management in particular(such as a mechanism of learning resources establishment and management); web page browsing record and learning path management; web-based learning duration and log-out time; learning resources and website browsing time; automatic approval functions of website upload; graphic display and full text indexing of discussions board and activity bulletin; cross-disciplinary uses of the system; an online assessment (e.g. web-based portfolio), in order to optimize the system. Subsequent research will also include qualitative and quantitative experimental studies of the system, in order to understand more about students' learning behavior pattern and its authentic effects on the students.

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